

2nd Cl 7
A3
--21. (New) The interdigitated capacitor as recited in Claim 15 wherein the metal is copper or a copper alloy.

22. (New) The interdigitated capacitor as recited in Claim 22 wherein the high-k dielectric layer comprises tantalum pentoxide.--

REMARKS/ARGUMENTS

The Applicants have carefully considered this application in connection with the Examiner's Action and respectfully request reconsideration of this application in view of the foregoing amendment and the following remarks.

The Applicants originally submitted Claims 1-20 in the application. Pursuant to a restriction requirement, the Applicants have canceled Claims 1-14 without prejudice or disclaimer. The Applicants presently amend Claims 15 and 18 and add new Claims 21 and 22. Accordingly, Claims 15-22 are currently pending in the application.

I. Formal Matters and Objections

The Examiner has objected to the title of the claimed invention as not being descriptive. Although the Applicants do not necessarily agree with the Examiner, a new title has been provided that is fully descriptive of the invention to which the claims are directed. Accordingly, the Applicants request the Examiner withdraw the objection.

II. Rejection of Claims 15, 19 and 20 under 35 U.S.C. §102

The Examiner has rejected Claims 15, 19 and 20 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,393,373 to Jun, *et al.* ("Jun"). However, Jun fails to anticipate independent Claim 15 and its dependent Claims 19 and 20 because Jun fails to disclose each and every element of Claim 15. Specifically, Jun fails to disclose first electrodes and a first conductive layer both comprising a metal. In contrast, Jun merely discloses doped polysilicon protrusions (26) that are formed on a doped polysilicon layer (24). (Column 7, lines 2-21; FIGs. 8a-8d). Since Jun only discloses that the protrusions (26) and layer (24) comprise doped polysilicon, Jun fails to disclose that the protrusions (26) and layer (24) comprise a metal. Jun also fails to disclose an electrode layer comprising the metal. Since Jun only discloses that the plate polysilicon layer (17) comprises doped polysilicon (as discussed above), Jun fails to disclose that the plate polysilicon layer (17) comprises a metal.

Therefore, Jun fails to disclose each and every element of Claim 15 and as such, is not an anticipating reference therefor. Because Claims 19 and 20 are dependent upon Claim 15, Jun also cannot be an anticipating reference for Claims 19 and 20. Accordingly, the Applicants respectfully request the Examiner to withdraw the §102 rejection with respect to Claims 15, 19 and 20.

Jun is also not an anticipating reference for new Claims 21 and 22, because Claims 21 and 22 are also dependent upon Claim 15.

III. Rejection of Claim 17 under 35 U.S.C. §103

The Examiner has rejected Claim 17 under 35 U.S.C. §103(a) as being unpatentable over Jun. As discussed above, Jun fails to teach first electrodes and a first conductive layer both comprising a metal. In addition, however, Jun fails to suggest first electrodes and a first conductive layer both comprising a metal. One skilled in the art would not be motivated to arrive at the present invention given the teachings of Jun because Jun only teaches that doped polysilicon protrusions (26) may be formed on a doped polysilicon layer (24), and there is no indication, motivation or even a mere suggestion to replace the doped polysilicon with metal as recited in Claim 15. (Column 7, lines 2-21; FIGs. 8a-8d). Jun also fails to suggest an electrode layer comprising the metal. In contrast, Jun only teaches that the plate polysilicon layer (17) comprises doped polysilicon (as discussed above), and again provides no indication, motivation or even a mere suggestion that doped polysilicon can advantageously be replaced with or comprise a metal. Moreover, the device taught in Jun is at the device level of an integrated circuit. As such, one skilled in the art would not be motivated to replace the polysilicon in Jun with metal due to the large thermal budget present in front-end processing used at the device level.

Accordingly, Jun fails to teach or suggest the invention recited in independent Claim 15 and its dependent claims. Therefore, Jun fails to support a *prima facie* case of obviousness of Claim 15 and its dependent Claim 17. Claim 17 is therefore not obvious in view of Jun.

In view of the foregoing remarks, Jun does not support the Examiner's rejection of Claim 17 under 35 U.S.C. §103(a). The Applicants therefore respectfully request the Examiner withdraw the rejection.

New Claims 21 and 22 are also not obvious in view of Jun, because Claims 21 and 22 are also dependent upon Claim 15.

IV. Rejection of Claims 16 and 18 under 35 U.S.C. §103

The Examiner has rejected Claims 16 and 18 under 35 U.S.C. §103(a) as being unpatentable over Jun in view of U.S. Patent No. 6,150,706 to Thakur, *et al.* ("Thakur"). As discussed above, Jun fails to teach or suggest first electrodes, a first conductive layer and an electrode layer all comprising a metal, as recited in Claim 15 of the present application.

Moreover, Thakur adds nothing to Jun because Thakur also fails to teach or suggest first electrodes, a first conductive layer and an electrode layer all comprising a metal. In contrast, Thakur merely discloses a conventional capacitor wherein only one of the electrodes (16) is formed from a barrier material, such as titanium nitride, tungsten nitride, tungsten silicon nitride or titanium silicon nitride. (Column 3, lines 1-8). Moreover, Thakur only discloses that the other electrode (12) is formed from a conductive material such as polysilicon, and fails to provide any indication, motivation or even a mere suggestion that the polysilicon electrode (12) can advantageously be replaced with or comprise a metal. Furthermore, as discussed above, one skilled in the art would not be motivated to replace the doped polysilicon of Jun's device-level electrodes (24, 26, 17) with the barrier material of Thakur's conductive barrier layer electrode (16) in view of the large thermal budget present in front-end processing used at the device level.

Thakur also fails to teach or suggest that an electrode layer is located over and between first electrodes to form interconnected second electrodes over and between the first electrodes. That is, Thakur is merely directed towards reducing leakage, depletion, thickness and resistance

by replacing one of the electrodes of a conventional dielectric layer with a conductive barrier layer. (Column 2, lines 30-40; Column 3, lines 12-35). This is in contrast to the claims of the present application which are directed towards forming interconnected second electrodes over and between first electrodes.

Accordingly, the combination of Jun and Thakur fails to teach or suggest the invention recited in independent Claim 15 and its dependent claims. Therefore, the combination fails to support a *prima facie* case of obviousness of Claim 15 and its dependent Claims 16 and 18. Claims 16 and 18 are therefore not obvious in view of the combination of Jun and Thakur.

In view of the foregoing remarks, the combination of Jun and Thakur does not support the Examiner's rejection of Claim 16 and 18 under 35 U.S.C. §103(a). The Applicants therefore respectfully request the Examiner withdraw the rejection.

New Claims 21 and 22 are also not obvious in view of the combination of Jun and Thakur, because Claims 21 and 22 are also dependent upon Claim 15.

V. Conclusion

In view of the foregoing amendment and remarks, the Applicants now see all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 15-22.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application.

Respectfully submitted,

HITT GAINES & BOISBRUN, P.C.

A handwritten signature in black ink, appearing to read "Charles W. Gaines". The signature is fluid and cursive, with the first name "Charles" being more prominent.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please amend the title of the invention as follows:

[INTERDIGITATED] CAPACITOR [AND METHOD OF MANUFACTURING
THEREOF] HAVING INTERDIGITATED ELECTRODES

IN THE CLAIMS:

(1) Please cancel Claims 1-14 without prejudice or disclaimer.

(2) Please amend Claim 15 as follows:

15. (Amended) An interdigitated capacitor, comprising:

first electrodes located on and interconnected by a first conductive layer, the first electrodes
and first conductive layer comprising a metal;

a high-k dielectric layer located over and between the first electrodes and on the first
conductive layer; and

an electrode layer comprising the metal and located on the high-k dielectric layer and over
and between the first electrodes to form interconnected second electrodes over and between the
first electrodes.

(3) Please amend Claim 18 as follows:

18. (Amended) The interdigitated capacitor as recited in Claim 15 wherein the high-k dielectric layer is comprised of a material [having a high dielectric constant] selected from the group consisting of:

lead zirconium titanate,

silicon nitride,

aluminum oxide, and

barium strontium titanate.

(4) Please add new Claims 21 and 22 as follows:

--21. (New) The interdigitated capacitor as recited in Claim 15 wherein the metal is copper or a copper alloy.

22. (New) The interdigitated capacitor as recited in Claim 22 wherein the high-k dielectric layer comprises tantalum pentoxide.--